



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/670,301	09/26/2003	Masaki Mizutani	03500.017597.	5357

5514 7590 07/11/2006

FITZPATRICK CELLA HARPER & SCINTO  
30 ROCKEFELLER PLAZA  
NEW YORK, NY 10112

EXAMINER

SONG, MATTHEW J

ART UNIT PAPER NUMBER

1722

DATE MAILED: 07/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/670,301	MIZUTANI ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Matthew J. Song	1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 April 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 7-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                    |                                                                             |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____                                                |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>4/18/06</u> .                                                             | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Withdrawn Rejections***

1. Applicant's arguments, see page 4 of the remarks, filed 4/18/2006, with respect to the rejection(s) of claim(s) 7-13 under 35 U.S.C. 103 rejection over Shibuya and the rejection(s) of claim(s) 7-13 under 35 U.S.C. 103 rejection Nakagawa have been fully considered and are persuasive. Therefore, the rejections has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the combination of Kiyota JP 58-201377 in view of Nishida (US 2002/0009895), and the combination of Nishida (US 5,254,481) in view of Nishida (US 2002/0009895).

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 7-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kiyota (JP 58-201377), an English Abstract has been provided, in view of Nishida (US 2002/0009895).

Kiyota discloses a silicon substrate with grooves having a reversely trapezoid type section, where the trapezoid shape clearly suggests applicant's inclined plane and the openings are narrowed due to the presence of the reverse trapezoidal shape since the opening at the bottom of the groove is large than the open near the top of the groove. (Abstract and Fig 3a-d).

Kiyota is silent to the purity of the silicon substrate.

In a method of forming a solar cell, note entire reference, Nishida teaches a forming a solar cell on a substrate of silicon comprising a metal grade silicon sheet having a low purity, acceptable for solar cells, containing 0.1-2% of impurities ([0035]), this clearly suggests applicant's substrate having a purity of less than 99.99%. Nishida also teaches a (100) silicon substrate ([0049]). Nishida also teaches low purity silicon is cheap and easy to use ([0035]).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Kiyota by using a low purity silicon substrate, as taught by Nishida, to reduce the cost of production because low purity silicon substrates are cheaper ([0035]).

Referring to claim 9, the combination of Kiyota and Nishida teaches a (100) silicon surface ('895 [0044]).

Referring to claim 10-11, the combination of Kiyota and Nishida is silent to the claimed width and depth of the grooves. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Kiyota and Nishida by changing the

Art Unit: 1722

size of the opening to obtain the claimed size because the size of the opening affect the properties of the device and changes in size are held to be obvious (MPEP 2144.03).

Referring to claim 12, the combination of Kiyota and Nishida teaches a solar battery element, this clearly suggests applicant's solar cell, and forming a P-N junction (Abstract).

Referring to claim 13, the combination of Kiyota and Nishida teaches an electrode 5 crossing over the grooves (Fig 3d).

4. Claims 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishida (US 5,254,481) in view of Nishida (US 2002/0009895).

In a method of manufacturing a solar cell, note entire reference, Nishida teaches a (100) silicon wafer surface **201** having angular silicon single crystals arranged regularly at intervals of 50  $\mu\text{m}$  (col 3, ln 1-67 and col 4, ln 35-68). The angular silicon single crystals **203** formed on the substrate have a inclined plane, note Fig 1D, and there is a gap between the silicon single crystals **203**, which are in communication with the inclined surface. The surface of the substrate is also inclined and communicates with gap.

Nishida is silent to the purity of the substrate.

In a method of forming a solar cell, note entire reference, Nishida teaches a forming a solar cell on a substrate of silicon comprising a metal grade silicon sheet having a low purity, acceptable for solar cells, containing 0.1-2% of impurities ([0035]), this clearly suggests applicant's substrate having a purity of less than 99.99%. Nishida also teaches a (100) silicon substrate ([0049]). Nishida also teaches low purity silicon is cheap and easy to use ([0035]).

Art Unit: 1722

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Nishida ('481) by using a low purity silicon substrate, as taught by Nishida ('895), to reduce the cost of production because low purity silicon substrates are cheaper ([0035]).

Referring to claim 8, the silicon single crystals 203 clearly suggests applicant's protusions which narrow the openings of the grooves, note fig 1D of '481.

Referring to claim 9, the combination of Nishida ('481) and Nishida ('895) teaches a (100) surface.

Referring to claim 10, the combination of Nishida ('481) and Nishida ('895) teaches a width of 50  $\mu\text{m}$ .

Referring to claim 11, the combination of Nishida ('481) and Nishida ('895) is silent to the claimed depth of the grooves. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Nishida ('481) and Nishida ('895) by changing the size of the opening to obtain the claimed size because the size of the opening affect the properties of the device and changes in size are held to be obvious (MPEP 2144.03).

Referring to claim 12, the combination of Nishida ('481) and Nishida ('895) teaches a pn junction ('481 col 7, ln 40-50).

### ***Response to Arguments***

5. Applicant's arguments with respect to claims 7-13 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Art Unit: 1722

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1722

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song  
Examiner  
Art Unit 1722

MJS  
June 29, 2006

  
YOGENDRA N. GUPTA  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700